MODULE 1

PERSONAL COMPUTERS - HARDWARE OVERVIEW

Personal Computers - Hardware Overview

OBJECTIVES

Students will be able to:

- Describe different components of the personal computer.

- Describe different storage interfaces.

- Be able to identify key factors for selecting various hardware components.

Personal Computers - Hardware Overview

- The Desktop Personal Computer

  - Case Styles
  - Case Exteriors, The Front and The Back
  - Components Inside
  - Peripheral Ports
  - Legacy Ports
  - Input Devices

Personal Computers - Hardware Overview

CASE STYLES

TOWERS

Personal Computers - Hardware Overview

CASE STYLES

DESKTOPS

Personal Computers - Hardware Overview

CASE STYLES

NOTEBOOKS

Personal Computers - Hardware Overview

CASE STYLES

HANDHELDS

Personal Computers - Hardware Overview

CASE STYLES

SUBNOTEBOOK

Personal Computers - Hardware Overview

CASE EXTERIORS

power button   power indicator   reset button   hard-disk drive access indicator   diskette-drive access indicator
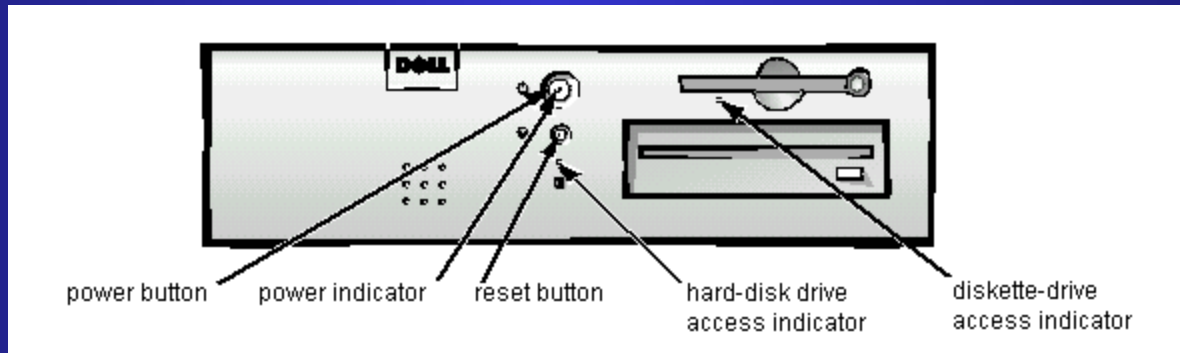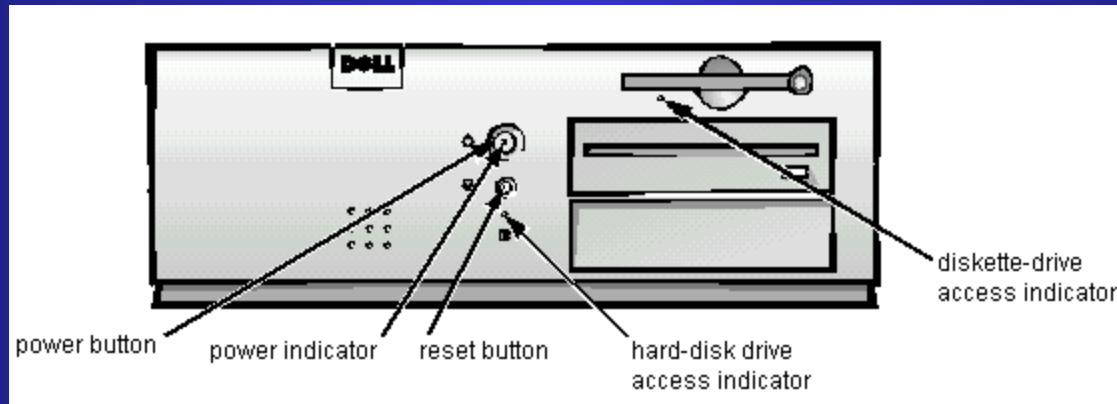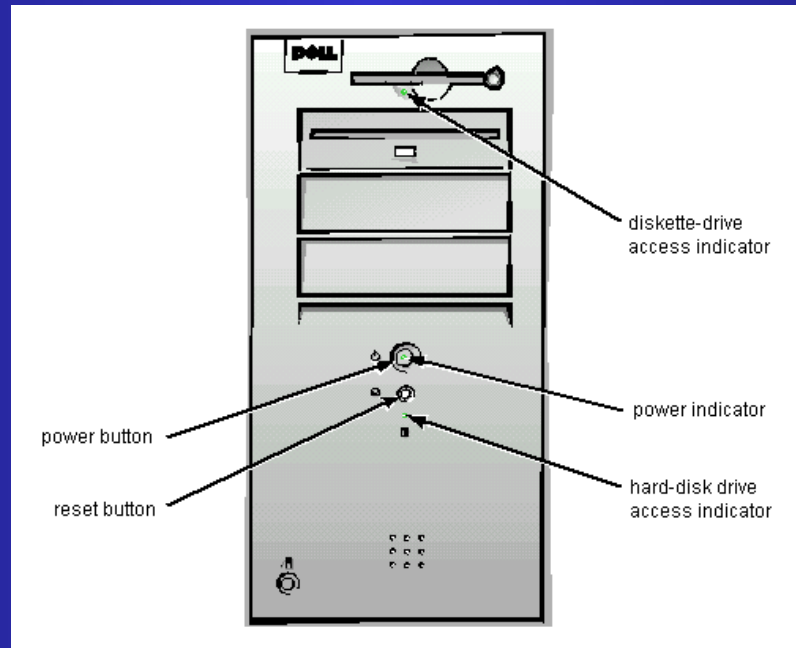
Personal Computers - Hardware Overview

CASE EXTERIORS

Personal Computers - Hardware Overview

CASE EXTERIORS

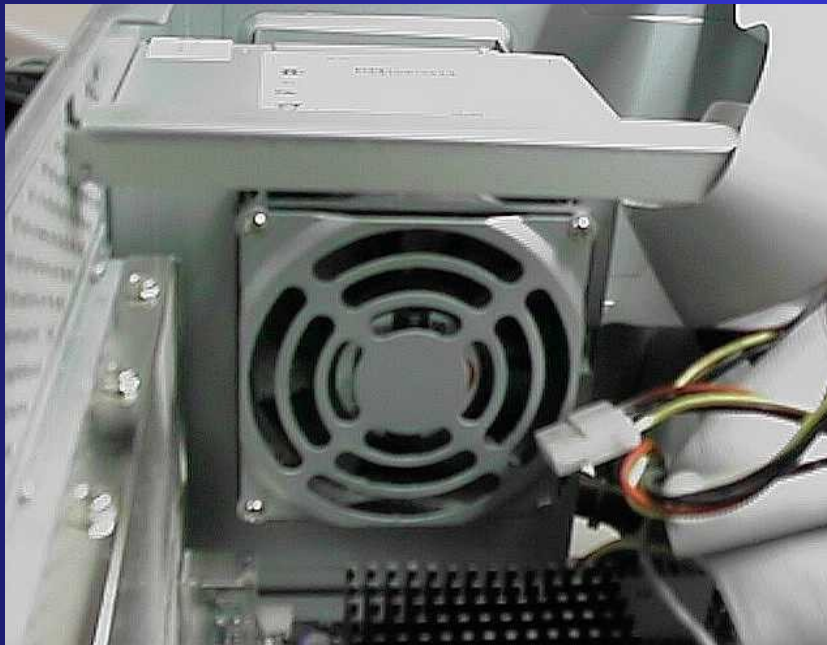# Personal Computers - Hardware Overview

COMPONENTS INSIDE

- Power Supply

- Motherboard

- Memory

- Expansion Bus

- Storage Interfaces

- Mass Storage Devices

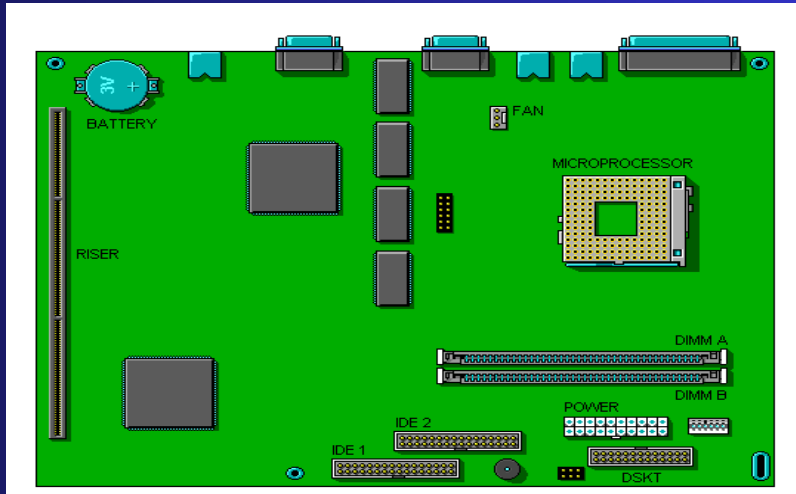# **Personal Computers - Hardware Overview**

Power Supply

- Switches AC power to DC power

-Which power supply you get will often be determined by the type of case

Personal Computers - Hardware Overview

MOTHERBOARD

- Determines many things about your system.

- CPU type and speed
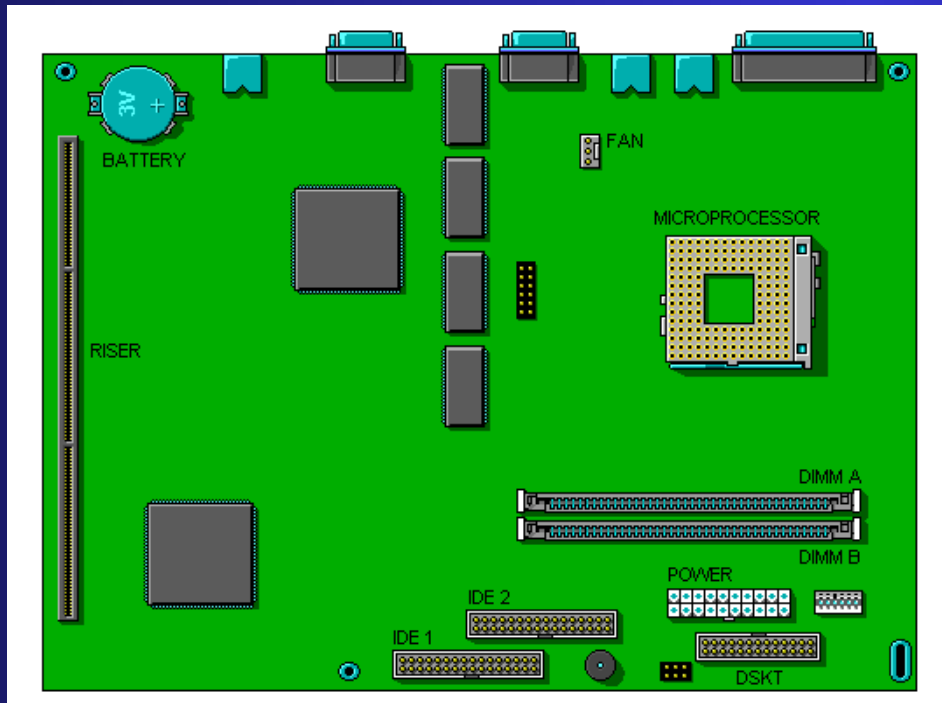
- Chipset

- Type of RAM

- Types of slots

- Plug and Play compatibility

- Type of keyboard and mouse

Personal Computers - Hardware Overview

BUS

Path which data flows

Personal Computers - Hardware Overview

MOTHERBOARD INCLUDES

- Basic Input Output System

(BIOS)

- Central Processing Unit (CPU)

Personal Computers - Hardware Overview

BASIC INPUT/OUT SYSTEM (BIOS)

- Single chip or circuit board.

- Holds software to be run during boot process.

- Contains info on all input/output devices

Personal Computers - Hardware Overview

CENTRAL PROCESSING UNIT (CPU)

- High speed switch is the "Computer".

- Does what it is told.

- Operates at speeds up to 1 Giga Hertz.

Personal Computers - Hardware Overview

CHOICES OF MICROPROCESSORS

- CELERON - Intel's entry-level microprocessor with a smaller but faster cache.

- MOBILE CELERON - Intel's low-power bargain chip for notebook systems.

- XEON - Intel's premier processor aimed at servers.

Personal Computers - Hardware Overview

CHOICES OF MICROPROCESSORS

- PENTIUM II - Intel's old flagship

- PENTIUM III - Intel's current top-of-line microprocessor for individual users.

- MOBILE PENTIUM III - Intel's current high-end notebook processor.

Personal Computers - Hardware Overview

CHOICES OF MICROPROCESSORS

- K6-2 - Once AMD's top processor, now their price leader that's popular on the desk and in notebook systems.

- K6-3 - Currently AMD's best chip with the unique three-level integral cache.

- Athlon - An AMD seventh generation processor - operates at 1 GHZ. First GHZ processor released.
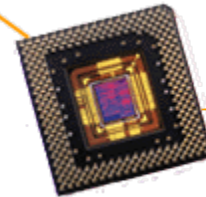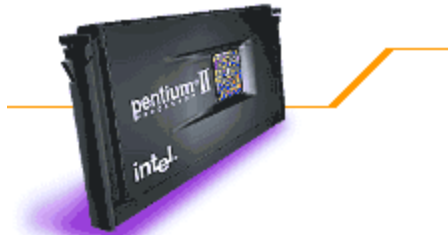
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CHOICES OF MICROPROCESSORS

- MII - A processor comparable to the Pentium II from Cyrix.

Personal Computers - Hardware Overview
CENTRAL PROCESSING UNIT
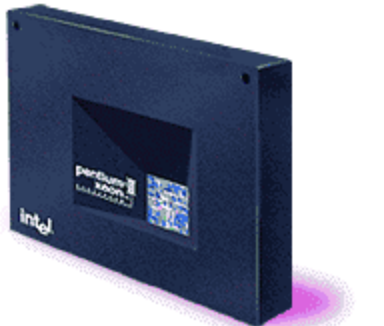
Personal Computers - Hardware Overview

MICROPROCESSOR CHIP
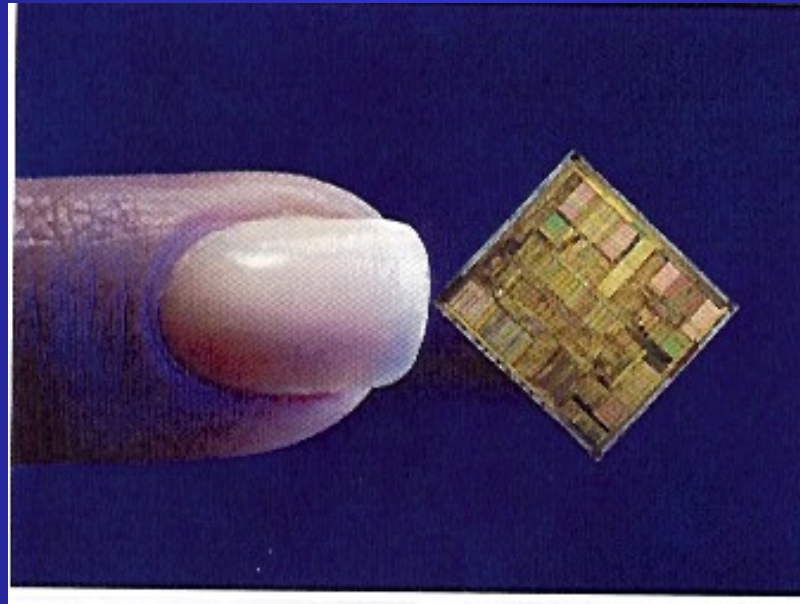
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MEMORY or RAM
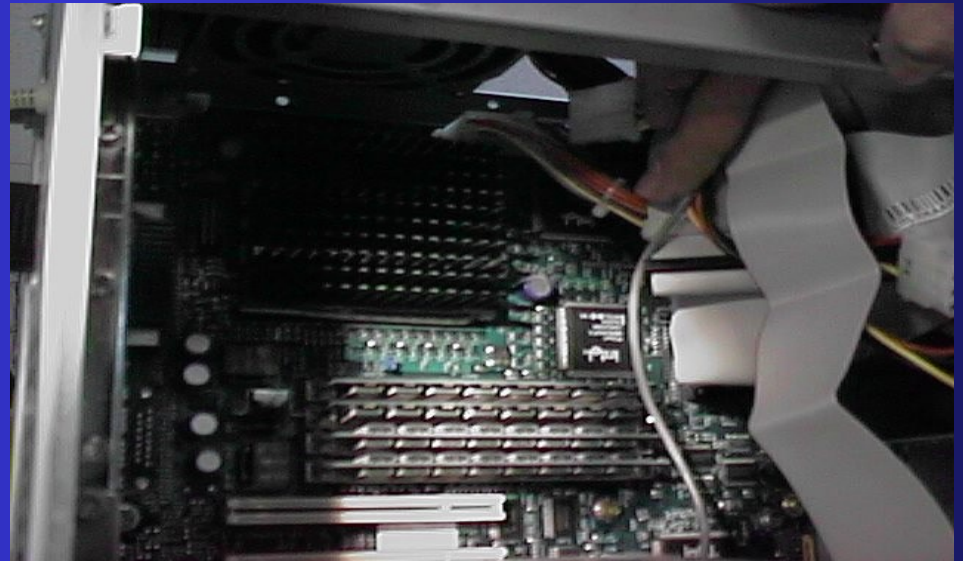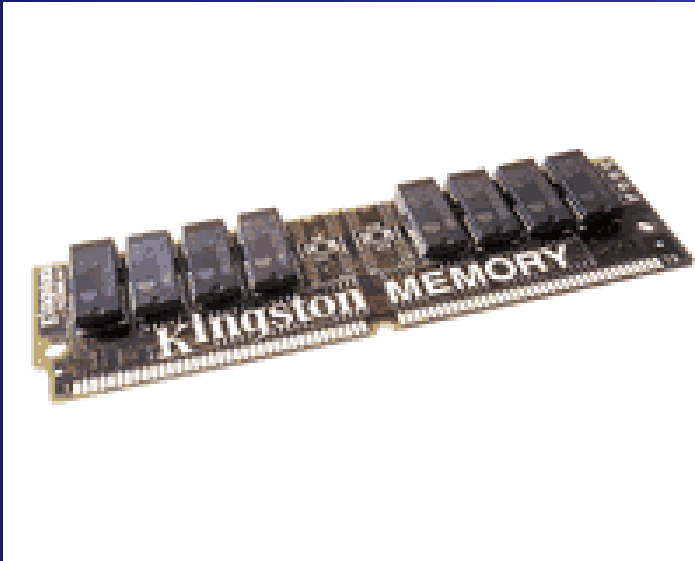
Personal Computers - Hardware Overview

COMPUTER MEMORY

- ROM - Read Only Memory
  - Memory that manufacturer stores small programs to make PC function. Example is BIOS.
- RAM - Random Access Memory
  - Memory available to user.
  - Dynamic RAM (DRAM) - needs refresh cycle
  - Static RAM (SRAM) - does not need a refresh cycle.

Personal Computers - Hardware Overview

RAM - Random Access Memory

- RDRAM - Rambus Dynamic Random Access Memory
  - A type of memory that operates at much higher frequencies than conventional 66 MHz or 100 MHz.
  - Able to load a new stream of data before the previous stream has completed, resulting in less waiting time and therefore faster access speeds.

Personal Computers - Hardware Overview

RAM - Random Access Memory

- SDRAM - Synchronous Dynamic Random Access Memory

  - High speed memory measured in megabytes (MB).

  - Enables a system to run applications and temporarily store documents that are being worked on.

Personal Computers - Hardware Overview

RAM

- Configurations
  - SIMMs - Single In-Line Memory Module
    - Circuit card with memory chips mounted on it
    - 72 pin edge connector
    - Added in pairs - To add 32 MB of RAM, install 2 16MB SIMMs or 4 8MB SIMMs.
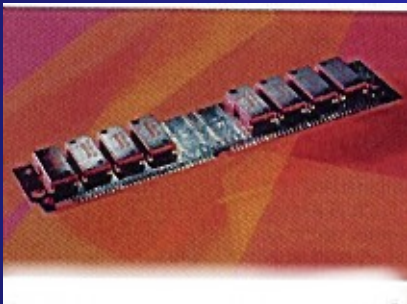
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Configuration

- DIMMs - Dual In-Line Memory Module

- Circuit board with edge connector.
- Use pins on both sides of edge connector, thus can deliver more data at a time.
- Edge connector is 168 pins.
- Installed singularly - To add 32 MB RAM add 1 32MB DIMM.

Personal Computers - Hardware Overview

Configuration

- RIMMs - Rambus In-Line Memory

- Module
  - Circuit board with edge connector.
  - Operate at much faster speed than the SIMMs or DIMMs.
  - Requires higher operating voltage.
  - Edge connector is 184 pins.
  - Installed singularly - To add 128 MB RAM add one(1) 128 MB RIMM.
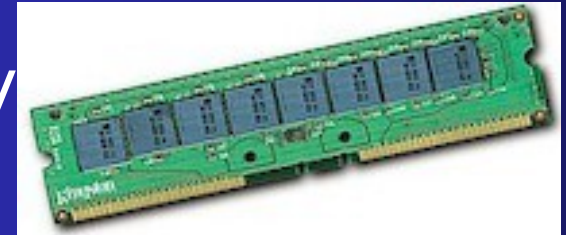
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Cache Memory

- Working area invisible to user.

- Processor uses cache to speed up operations.

- Operates separately from other memory

- Works directly with processor.

- Typically 512K Cache Memory.

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CMOS EEPROMs (Complimentary Metal Oxide Semiconductor Electrically Erasable Programmable Read Only Memory).

- Holds system configuration to identify the hardware inside the PC.

- Battery in PC helps CMOS retains it data

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NOTEBOOK MEMORY

- Same types of Memory as Desktops except

  - Smaller packaging.

  - Usually a little more expensive.

  - Not always as expandable.

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Memory issues to consider when purchasing a new PC or considering upgrading memory.

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- Speed - How quickly your memory passes data to your microprocessor.

- Today's quickest memory is ready within eight nanoseconds.

- Front Side Bus - The channel through which data moves from memory to your microprocessor.

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-Technology - How the memory is fabricated and used.

- Capacity - How many bytes (in millions) a module of memory can store.

- Package - The physical form of memory that determines whether it will fit into your PC.

Personal Computers - Hardware Overview

-Module Addressing - Tells how many address lines reach into a module and how many modules you need to make a single bank of memory.

-Cache Memory - Special high speed memory that matches the microprocessor speed to slower memory systems.

Personal Computers - Hardware Overview

HOW DOES MEMORY WORK?

- Like an elaborate set of pigeon holes used by post office workers to sort local mail.

-Memory location called an address -

-Address is a label, not the storage location itself.

-The amount of data stored at each memory location depends on the basic storage unit, which varies with the design of the computer system.

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HOW DOES MEMORY WORK?
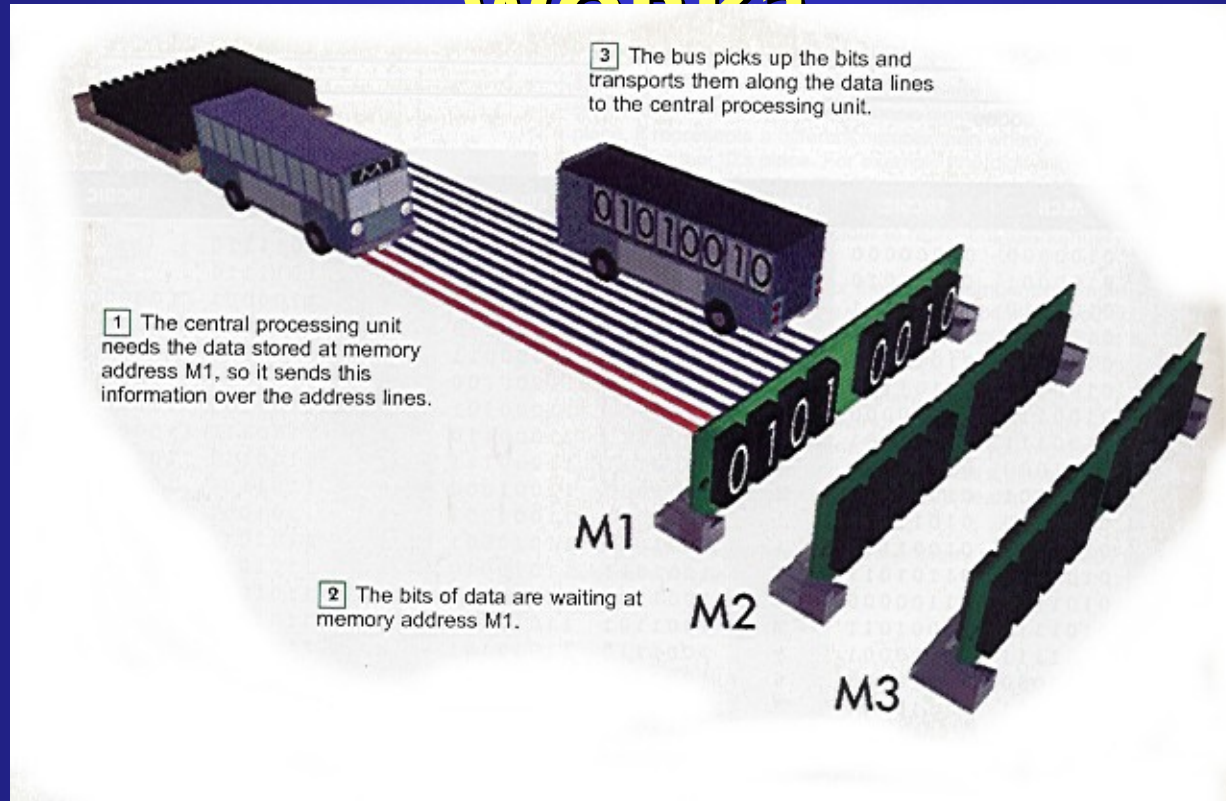
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HOW MUCH MEMORY DOES YOUR PC NEED?

-Depends on which operating system your using.

- Also what applications you are running.

Operating System	Minimum Requirements	Recommended Requirements
Windows 95 – Release A	4 MB	16 MB
Windows 95 – OSR2 and later	16 MB	32 MB
Windows 98	16 MB	32 MB
Windows NT	16 MB	32 to 64 MB
Windows 2000	64 MB	128 MB

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EXPANSION BUS

- Allows your system to grow.

- Provides high speed connections for internal peripherals.

- Allows for interchangeable PC expansion boards.

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TYPES OF EXPANSION BUS

- Bus-style expansion

- Card-style

expansion

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BUS-STYLE EXPANSION

- Peripheral Component Interface (PCI)

   - Main expansion bus in modern PCs.

   - Allows you to add almost any expansion board into your PC.

   - Uses a "Bridge circuit" that acts as a buffer between parts of your PC.

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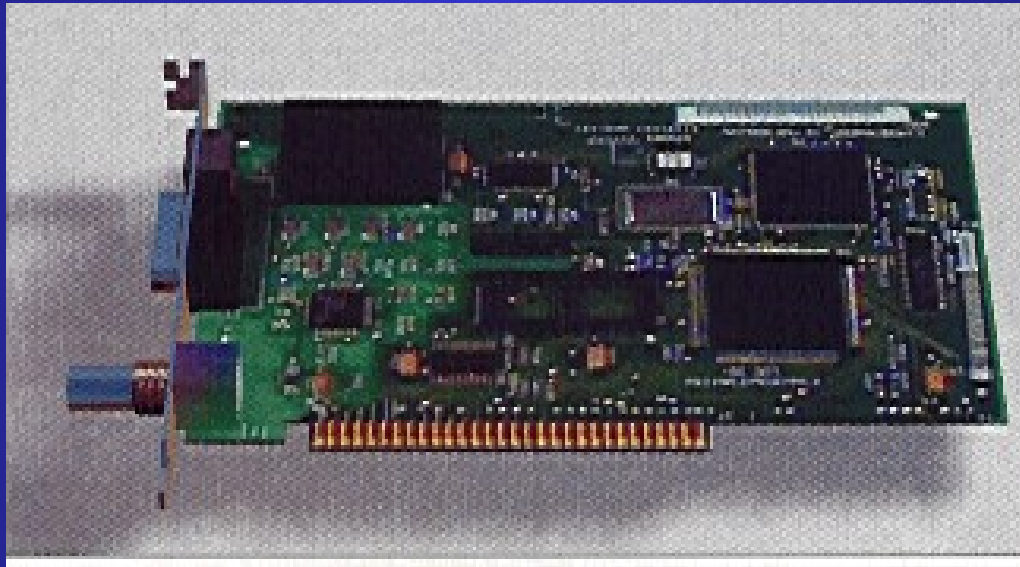
PCI CARD

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BUS-STYLE EXPANSION

-Accelerated Graphics Port (AGP)

- Higher speed link to a PC graphic display system.

- Lets PC display data up to 8 times faster than PCI.

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BUS-STYLE EXPANSION

- Industry Standard Architecture (ISA)

  - Slots that follow the old expansion slot standards.

  - Allows you to use "Legacy" boards (long boards).

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BUS-STYLE EXPANSION

-Enhanced Industry Standard Architecture (EISA)

- Faster form of ISA (now replaced by PCI).

- Each EISA card has to have own IRQ, DMA channel, and I/O address(es).

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EISA CARD

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BUS-STYLE EXPANSION

- Micro Channel Architecture (MCA)

  - IBM proprietary improvement over ISA and EISA.

  - Used a configuration utility that had to be saved to a disk to make changes.

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BUS-STYLE EXPANSION

-VESA Local Bus (VL BUS)

- Extension of ISA to make video systems faster.

- Quickly replaced by PCI.

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CARD-STYLE EXPANSION

- PC Card (PCMCIA)

  - ISA Expansion roughly on a credit-card size.

  - Primarily used in Laptops.

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CARD-STYLE EXPANSION

- Cardbus

  - PCI-style expansion on credit-card size module.

  - Primarily used in laptops and handlhelds.

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CARD-STYLE EXPANSION

- CompactFlash

    - Miniaturized version of the PC Card.

    - Optimized for Flash Memory.

    - Used primarily for digital cameras and flash memory.

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CARD-STYLE EXPANSION

- Solid State Floppy Disk (SMARTMEDIA)

    - Tiny package that lets you interchange flash memory chips..

    - Popular with digital cameras and handheld PDAs.

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EXPANSION CARDS

- Sometimes called Accessory cards.

- Inserted the Bus Expansion slots.

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EXPANSION CARDS

The Network Interface Card (NIC)

- Hardware that connects PC to network.

- Can also be integrated into motherboard.

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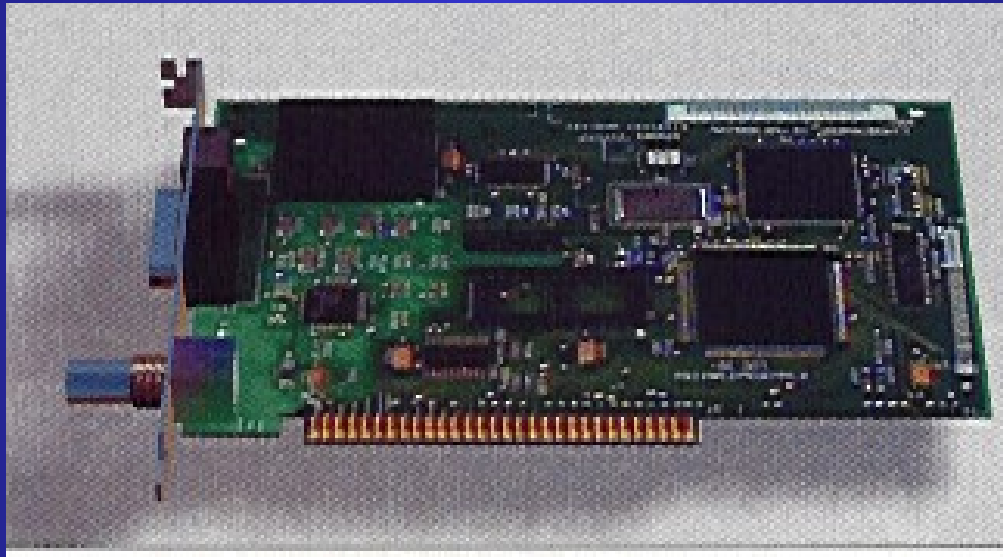
NETWORK
INTERFACE CARD

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EXPANSION CARDS

MODEMS

- Modulator/Demodulator.

- Converts digital signals to analog signals and back..

- Used on Plain Old Telephone System (POTs) lines.

- Maximum speed today is 56KBps.

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MODEM

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EXPANSION CARDS

Video Cards

- Interface between computer and monitor.

- Contains video memory to hold images that are to be converted to be displayed by monitor.

- Converts the digital image that is created by the system to an analog image to be used by the monitor.

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EXPANSION CARDS

Video Cards
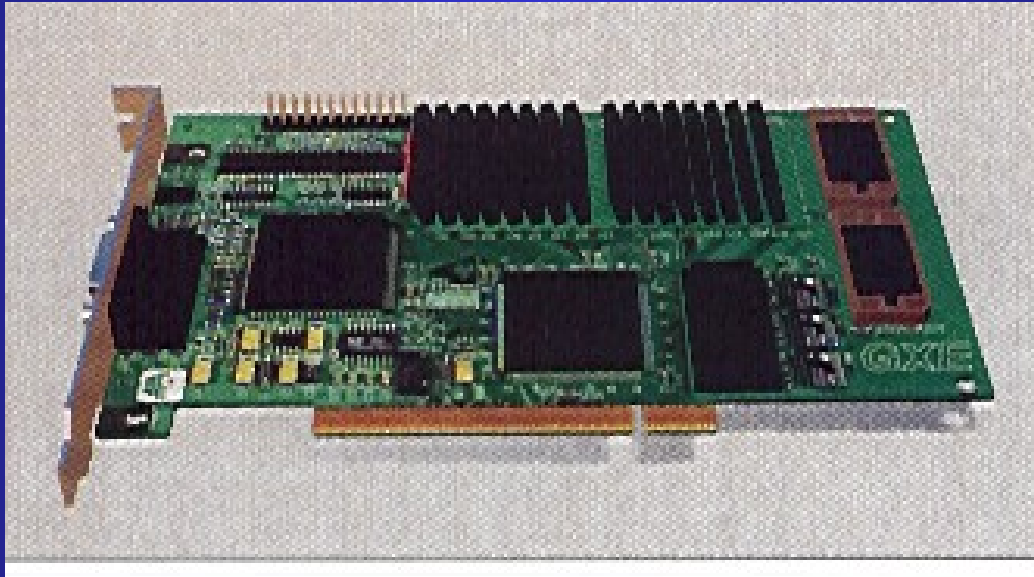
-Distinguished by their resolution.

- Has accelerator chip to speed up operation.

Personal Computers - Hardware Overview

VIDEO ADAPTER CARD

EXPANSION CARDS

Sound Cards

- Step up from basic sound system of a PC.

- Includes additional functions to support multimedia.

- MIDI Interface to connect electronic musical instruments to the PC.

- Can include CD drive interfaces.

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EXPANSION CARDS

Sound Cards

- Distinguished by the 3 C's of sound:

- COMPATABILITY - Determines the software with which a given soundboard will work.

-CONNECTIONS - Determines what you plug in, usually MIDI and CD devices.

- QUALITY - How satisfied you will be with the results.

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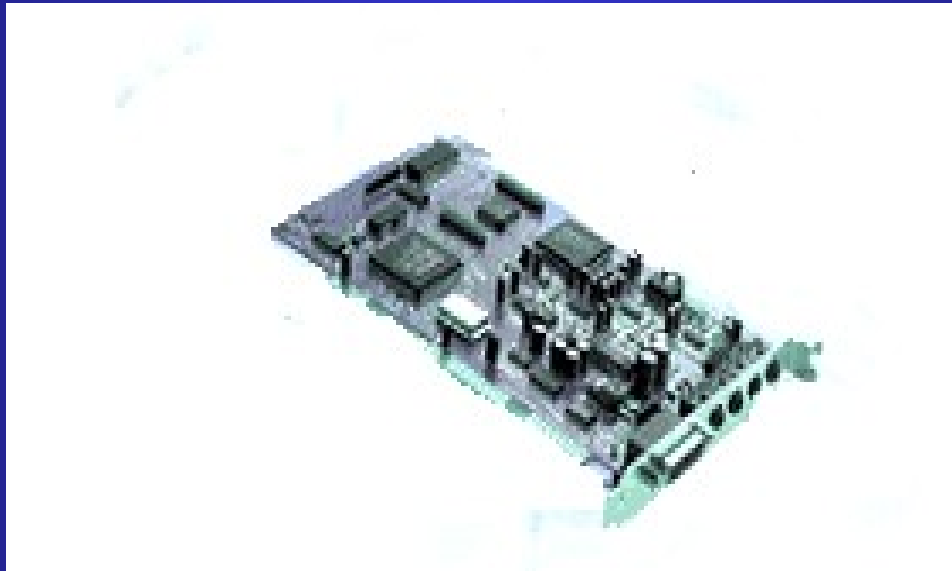
SOUND CARD

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STORAGE INTERFACES

- An interface links two disparate devices together.

- Most important in mass storage devices.

- Determines how PC controls device.

- Sets limits on overall performance of

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STORAGE INTERFACES

- Usually will be one of two type of interfaces

   - AT Attachment (ATA).

   - Small Computer System Interface (SCSI) .

- Also includes floppy disk controller.

Personal Computers - Hardware Overview

STORAGE INTERFACES

AT Attachment (ATA)

- Also known as Integrated Drive Electronics (IDE).

- Evolution led to variations of the ATA to include ATA-2, ATAPI, EIDE, Fast ATA, ATA/66, UDMA, UDMA/66, etc.

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STORAGE INTERFACES

AT Attachment (ATA) (Continued)

- Enhanced IDE (EIDE) was an improvement over original ATA standard.

- ATA Packet Interface (ATAPI) was a result of effort to extend reach of ATA ports to CD-ROM and tape drives.

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STORAGE INTERFACES

- Benefits of EIDE are:

    - Supports Logical Block Addressing (LBA).

    - Higher data transfer rates.

    - Competes with SCSI.

- Each port can support two devices (most systems have two ports).

- Each device has settings to be master or

Personal Computers - Hardware Overview
STORAGE INTERFACES

Small Computer System Interface (SCSI)

- System level interface (expansion card). Essentially creates a complete expansion bus (or subbus).

- Several types of SCSI:

  - Fast SCSI

  - Ultra SCSI

  - Fast/Wide SCSI

  - Etc.

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STORAGE INTERFACES

SCSI (continued)

- Originally way to add hard drives to computers.

- Evolved to a complete interconnection system that can link hard disk drives, CD ROM players, scanners, etc.

- Today is the preferred interface for hard drives in server-based systems.

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STORAGE INTERFACES

SCSI (continued)

- Added through expansion cards.

- Single channel can support 8 devices (one of which is controller).

- Wide SCSI can support up to 15 devices.

- Can mix different standards with proper adapters.

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STORAGE INTERFACES

SCSI (continued)

- Each unit assigned:

  - An address

  - A non-conflicting ID number

- Connected through daisy chain concept.

  - Chains must be terminated through
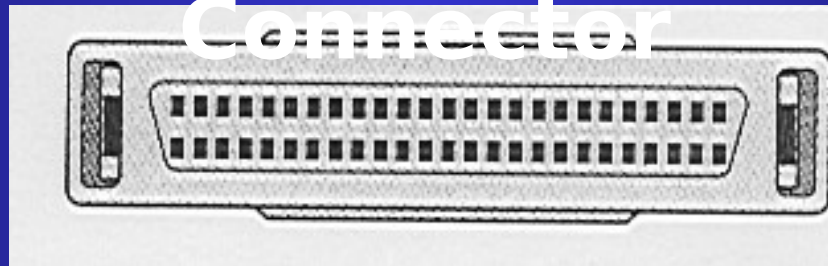
    - device called terminator OR

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STORAGE INTERFACES

SCSI1 Connector

SCSI2 Connector

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STORAGE INTERFACES
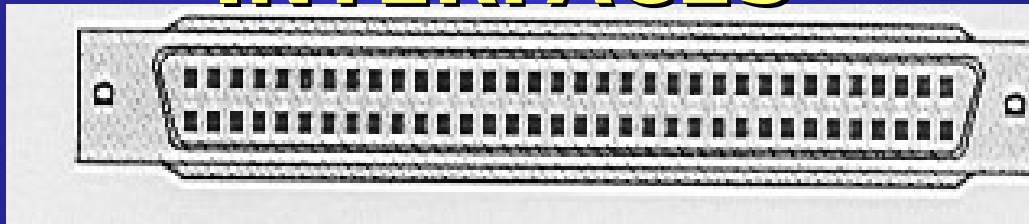
SCSI3 Connector
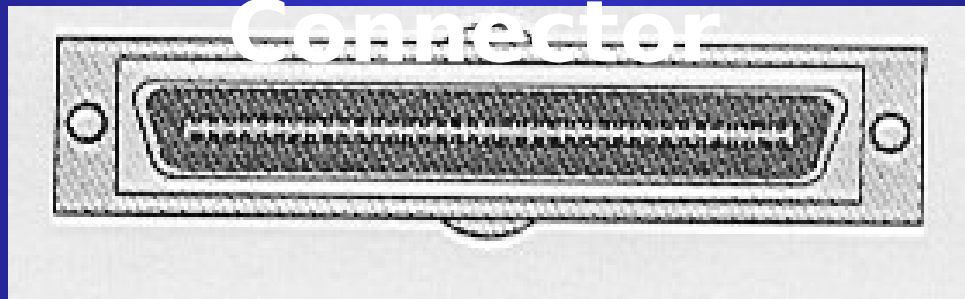
SCSI5Connector

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TYPICAL SCSI ID ASSIGNMENTS

Wide SCSI ID	Narrow SCSI ID	Priority	Usual Assignment
0	0	Lowest	Boot hard disk drive
1	1	Low	Second hard disk drive
2-14	2-6	Ascending	Removable media devices
15	7	Highest	SCSI host adapter

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FLOPPY DISK INTERFACE

- One piece of computer that has remained relatively unchanged.

- However, undergoing change.

  - High capacity drive my use ATA or SCSI.

  - External drives shifting to USB.

- On motherboard.

- Can handle 2 devices.

- Drives letters determined through cabling (A & B).

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MASS STORAGE DEVICES

- Where you put data that will not fit into memory.

- Designed to hold and retrieve megabytes at moment's notice.

- Comes in multiple formats:

    - Magnetic

    - Optical

    - Etc.

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MASS STORAGE DEVICES

Storage is measured in units called bytes.

Unit	Abbreviation	Size in Units	Size in Bytes
Kilobyte	KB or K	1,024 bytes	1,024
Megabyte	MB or M	1,024 kilobytes	1,048,576
Gigabyte	GB	1,024 megabytes	1,073,741,824
Terabyte	TB	1,024 gigabytes	1.099,511,627,776
Petabyte	PB	1,024 terabytes	1,125,899,9006,843,624
Exabyte	EB	1,024 petabytes	1,152,921,504,607,870,976
Zettabyte	AB	1,024 exabytes	1,180,591,620,718,458,879,424
Yottabyte	YB	1,024 zettabytes	1,208,925,819,615,701,892,530,176

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MASS STORAGE DEVICES
FLOPPY DISKS

- Premier data exchange medium for PCs.

- Most PCs come with one floppy disk.

- Multitude of sizes from 2.5 to 8 inches.

    - Includes things like:

      -ZIP Drives

      -LS-120

      -3.5 and 5.25 floppies

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MASS STORAGE DEVICES
FLOPPY DISKS

- Traditional Floppy Disk

   - 3.5 inch and 5.25 inch

   - 160 KB to 1.44 MB.

   - Most PCs come with one floppy disk in 3.5 inch size.

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MASS STORAGE DEVICES
FLOPPY DISKS

- LS-120 Disks

    - Super Disk - 120MB.

    - First Marketed in 1996.

    - Resembles 3.5 inch disk.

    - Backward compatible with 3.5

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MASS STORAGE DEVICES
FLOPPY DISKS

- Iomega ZIP Drives

  - 100 MB and 250 MB.

  - Backward Compatible.

  - Reusable.

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MASS STORAGE DEVICES
FLOPPY DISKS

- Iomega ZIP Drives
  - Comes in following interfaces:
    - SCSI
    - USB
    - EIDE
    - Parallel

Personal Computers - Hardware Overview

MASS STORAGE DEVICES
FLOPPY DISKS

- Iomega JAZ Drives

  - I GB and 2 GB.

  - Backward compatible.

  - Reusable.

  - Comes in one interface: SCSI.

Personal Computers- Hardware Overview

Personal Computers- Hardware Overview

Personal Computers - Hardware Overview

MASS STORAGE DEVICES HARD DISK DRIVES

- Premiere mass storage device.

- Available in multitude of size and interfaces:

  - 80+ GB in EIDE Interface.

  - ??? in SCSI interfaces.

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Things to consider when selecting a additional drive, replacing current hard drives, or when buying a new PC.

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- INTERFACE -   SCSI or ATA

- DATA TYPE - Interface sub-issue. Is it UDMA/66, etc.

- CONNECTOR - Part of interface, but separate issue, particularly SCSI.

- CAPACITY - Buy the biggest drive you can afford.

Personal Computers - Hardware Overview

-SPEED - Consider a faster drive. If you can afford look at 5400 RPM, 7200 RPM or 10000 RPM drives.

-PACKAGE - What size slot will it fit in, 3.5" or 5.25" drives.

- BIOS - Will your BIOS support the full capacity of the drive.

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REMEMBER : HARD DRIVES HAVE WARRANTIES - NOT YOUR DATA. ALWAYS BACK UP YOUR DATA.

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Hard Disk Drive

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MASS STORAGE DEVICES

CD-ROM DRIVES

- Starts reading at center while the CD spins fast and continues to read to outer edge where spins much slower.

    - Outer edge disc spins about half as fast as inside.

  - X Factor - the base speed is 1X, thus 2x is twice as fast, 4X is four times, etc.

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MASS STORAGE DEVICES
CD-ROM DRIVES

- 2X amounts to about 4800 RPMs (from the inside).

- Faster the drive, the longer it takes to spin up, thus inversely, slower to quit spinning.

- Capacity is 650 MB.

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MASS STORAGE DEVICES
CD-ROM DRIVES

- DVD Drives

  - Digital Versatile Disc (DVD).

  - X factor pegged to base rate of original video-only DVD system.

  - Every DVD "x" is worth about 6 x's from CD.

  - Capacity up to 20GB (High Density).

Personal Computers - Hardware Overview

Issues to consider when judging CD and DVD drives in new PCs or to consider when upgrading or replacing drives.

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- FORMAT - DVD does everything that CD does (at least in playing back).

- SPEED - Faster is better. 40X or better on CDs, 6-8x or better on DVDs.

-INTERFACE - ATAPI are cheaper, but SCSI do better digital extraction. Also available in USB.

Personal Computers - Hardware Overview

- VIDEO DECODER - Required for watching DVD movies, irrelevant for CDs. Hardware decoders faster than software and produce better images. Hardware cost more.

-WRITABILITY - CD-R let you make own CDs, but CD-RW (rewritable) do more. DVD writing available but expensive and standards are changing rapidly for DVD. Hold off on writable DVD for awhile.

Personal Computers - Hardware Overview

PERIPHERAL PORTS

- Links PC and external components.

- Most PCs include traditional ports – (legacy parallel and serial)

- New technology allows new ports –

   -USB

   -Firewire

   -Infrared

Personal Computers - Hardware Overview

PERIPHERAL PORTS
UNIVERSAL SERIAL BUS (USB)

- Today's general purpose choice.

- Combines moderate performance with goof proof connection system.

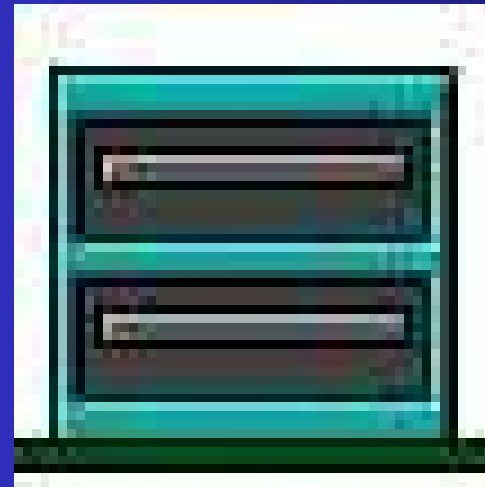- Data transfer rate of 12 MBps.

- Low cost interface.

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PERIPHERAL PORTS
UNIVERSAL SERIAL BUS (USB)

USB CONNECTOR

USB PORT

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PERIPHERAL PORTS
FIREWIRE (IEEE 1394)

- Approximately 10 times faster than USB.

- More expensive than USB.

- Fits in SCSI III scheme as far as speed.

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PERIPHERAL PORTS
INFRARED (IrDA)

- Wireless Connection.

- Needs line of site for connection.

- Allows for wireless mice, keyboards, etc.

- Modest performance.

Personal Computers - Hardware Overview

LEGACY PORTS

- Traditional way of connecting peripherals to your PC.

    - Serial

    - Parallel

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LEGACY SERIAL PORTS

-Includes things like Comm ports, RS232 ports, etc.

- Can be connected externally or internally.

- Most systems come with a default of two Comm ports but more may be added.
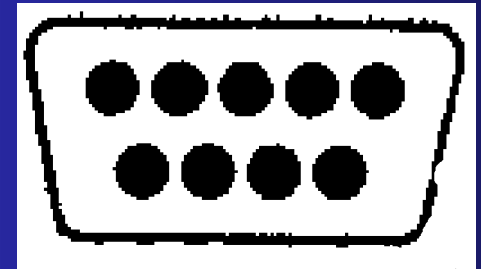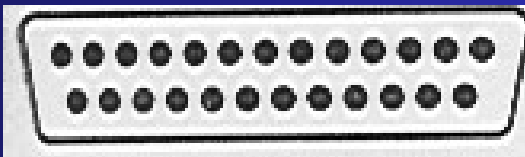
Personal Computers - Hardware Overview

LEGACY SERIAL PORTS

- Used for things like modems, mice, printers, digital cameras, etc.

DB 25

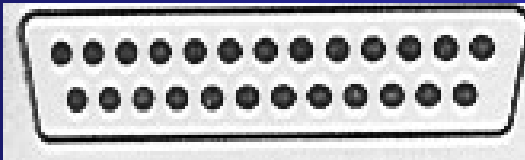**DB 9**

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LEGACY PARALLEL PORTS

- Commonly known as printer ports of LPT ports.

- Can be used with ZIP drives, CD Drives, scanners, etc.

- Commonly uses 25 pin connector known

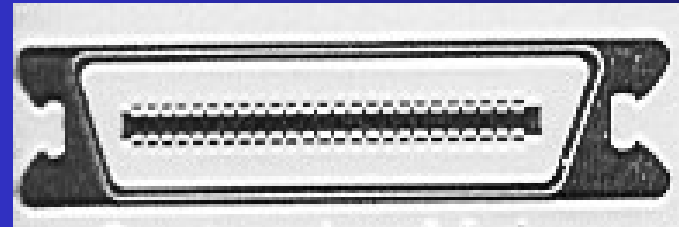as a centronics connector.

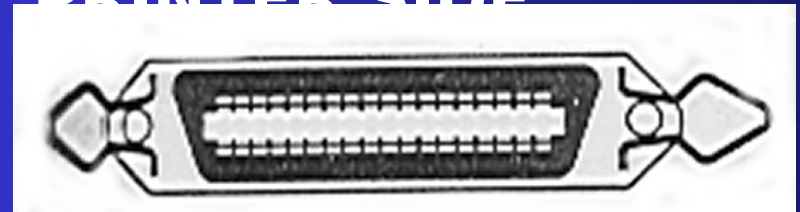# Personal Computers - Hardware Overview

LEGACY PARALLEL PORTS

DB 25 COMPUTER SIDE

DB 25 (CENTRONICS) PRINTER SIDE

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DISPLAY SYSTEMS

- Makes your system interactive.

- Consists of display adapter and monitor.

- Capability to get up to 16.7 million colors.

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DISPLAY SYSTEMS

DISPLAY ADAPTERS

- ACCELERATOR - The actual chip that does the work on generating onscreen image. (Chips referred to as 2D or 3D.

- MEMORY - Used by the accelerator to create and store the onscreen image.

- BANDWIDTH - The electronic limit on the displayable video signals.

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DISPLAY SYSTEMS

DISPLAY ADAPTERS - Basic Features

-RESOLUTION - The measurement of the sharpness of the image.

-BUS INTERFACE - How the video systems links to the rest of your PC's circuitry.

-VIDEO INTERFACE - How graphics board links to your display.

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DISPLAY SYSTEMS

DISPLAYS (MONITORS)

- Keyhole you peer through to see what PC is doing.

- Affects quality, detail, sharpness and color.

- Today using new technology like flat screens and high resolution.

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DISPLAY SYSTEMS

DISPLAYS (MONITORS)

Things to consider when

deciding what monitor to buy

or use.

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DISPLAY SYSTEMS

DISPLAYS (MONITORS)

- TECHNOLOGY - Cathode Ray Tube (CRT) or Flat Panel.

- SCREEN SIZE - Bigger lets you see more detail at higher resolutions.

- RESOLUTION - The number of pixels a monitor can display.

- DOT, SLOT, OR PIXEL - The distance between physical elements of display that can be

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DISPLAY SYSTEMS

DISPLAYS (MONITORS)

- SHARPNESS - Quality of image that you can actually see.

- REFRESH RATE - How often image gets repainted.

- CONNECTORS - The jacks on the back of the monitor.

Personal Computers - Hardware Overview

DISPLAY SYSTEMS

You probably will use this type of cable coming off the monitor (Left) and this is what the port on the back of the PC might look like (Right) **.**
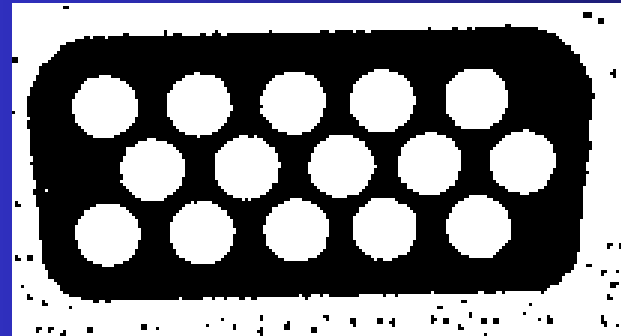
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AUDIO SYSTEMS

- Standard sounds ranges from beeps and squeaks of tiny internal speakers to an aural rush equal in quality to today's best stereo CDs.

- Today's high quality sound capability distinguishes multimedia PCs from ordinary visual bound systems.

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AUDIO SYSTEMS

IMPORTANT   AUDIO

FEATURES OF THE MODERN

PC

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AUDIO SYSTEMS

- BASIC SOUND SYSTEM - Allows your PC to beep.

- SOUND BOARD - Give your PC the ability to capture and reproduce sounds and music. May be integrated on your motherboard.

- MICROPHONE - Captures live sound. Can be used to record music, make voice annotations, or turn your PC into a

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AUDIO SYSTEMS

- LOUDSPEAKERS -   Gives PC a voice you can hear or feel - the sounds and effects generated by your applications.

- CD DRIVE - Lets PC play pre-recorded discs and data files. A CD-R drives lets you record CDs for your stereo system.

- SYNTHESIZER - Sound board feature that allows your PC to create new musical sounds.

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AUDIO SYSTEMS

- MIDI - Allows you to control external electronic musical instruments with your PC.

- MP3 - Standard file format for compressed music that lets you turn your PC into a juke box.

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INPUT DEVICES

- The way you move information into your PC – primarily how you interact with PC.

- Span large range of technologies.

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INPUT DEVICES - KEYBOARDS

- 104 key keyboard for about $25.00.

- Might have to replace every 2 years.

- Key covers hard to replace - just replace keyboard.

- Three type connectors AT, PS2, and USB.

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INPUT DEVICES – POINTING DEVICES

- Trackballs

- Mice

  - Optical

  - Wireless

  - Two or three button

  - Glide Points on Laptops

- Clean frequently

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Summary

Review Questions